

# The Scientific Revolution



# The Scientific Revolution:

- with its emphasis on reasoned observation and systematic measurement.. It changed the way people viewed the world and their place in it.

## The Scientific Revolution

- before SR, knowledge often based on superstition/belief
- disagreeing w/Catholic Church = heresy

Q: What effect could this have on people trying to learn new things?

# The Scientific Revolution

-opposite of basing ideas on belief = using reason

Q: What would using reason mean?

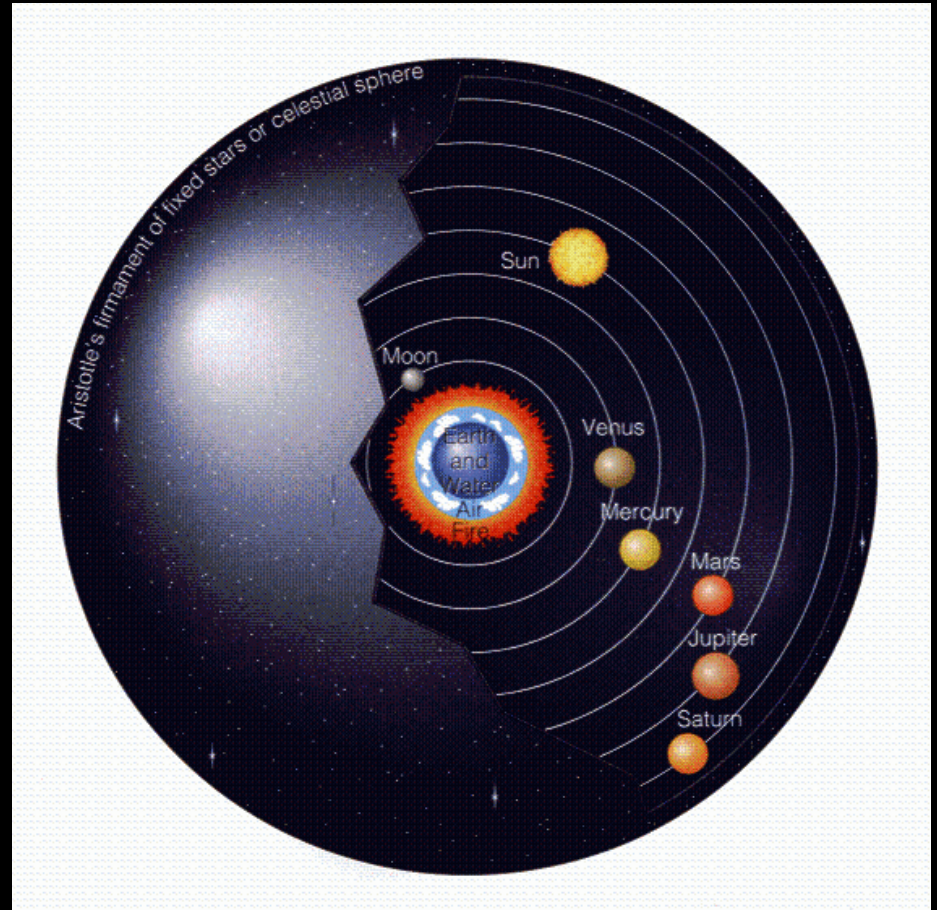
-reason = using logic & observation to figure something out

Q: Give me an example of using reason?



# The First Big Challenge: The Heliocentric Theory

- The accepted model of the solar system had been put forward by an ancient astronomer named Ptolemy (TOL-uh-mee), who placed the earth in the center of the universe.



## The Scientific Revolution

-ex. Copernicus - kept heliocentric theory to himself

Q: Any guess what heliocentric means?

Here's a hint...

# **\*\*Nicolaus Copernicus—Developed the Heliocentric Theory**

- Nicolaus Copernicus (1473-1543) challenged this model, arguing that the earth was a planet that revolved around the sun. Copernicus's model for the solar system is called the **heliocentric** (hee-lee-oh-SEN-trik) system.



# Heliocentric- with the sun at the center

- \*\*He supported his claim with mathematical calculations about the orbits of the planets. Unfortunately for Copernicus, his work was flawed in its observations and its assumptions.

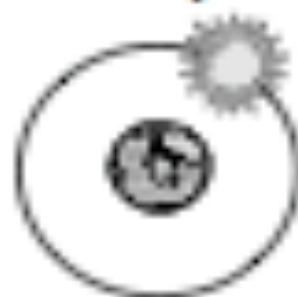


# The Scientific Revolution

- heliocentric = sun is center & planets orbit around it

- church said earth was center

Q: Why would Copernicus keep his idea to himself?



# Nicolaus Copernicus's Heliocentric Theory error?

A diagram illustrating Nicolaus Copernicus's heliocentric model of the universe. At the center is a realistic image of the Earth, showing continents and oceans. Surrounding the Earth are several concentric circular orbits, represented by thin blue lines. Small yellow dots, representing planets, are positioned at various points along these orbits. The diagram is set against a black background, emphasizing the geometric structure of the model.

- \*\*He assumed (wrongly) that the planets traveled in concentric circular orbits—perfect circles.
- Later discoveries, however, firmly demonstrated that the earth and the other planets orbit the sun.

- \*\*Danish astronomer Tycho Brahe (TEE-koh BRAH-hee) made very extensive and accurate observations that more strongly supported Copernicus.
- German astronomer Johannes Kepler will soon solve the problem of the planets' orbits





- \*\*Johannes Kepler discovered that the planets travel in stretched-out circles called ellipses.

The new science  
was bolstered by  
the use of  
instruments that  
made scientific  
observation more  
accurate than  
ever before.

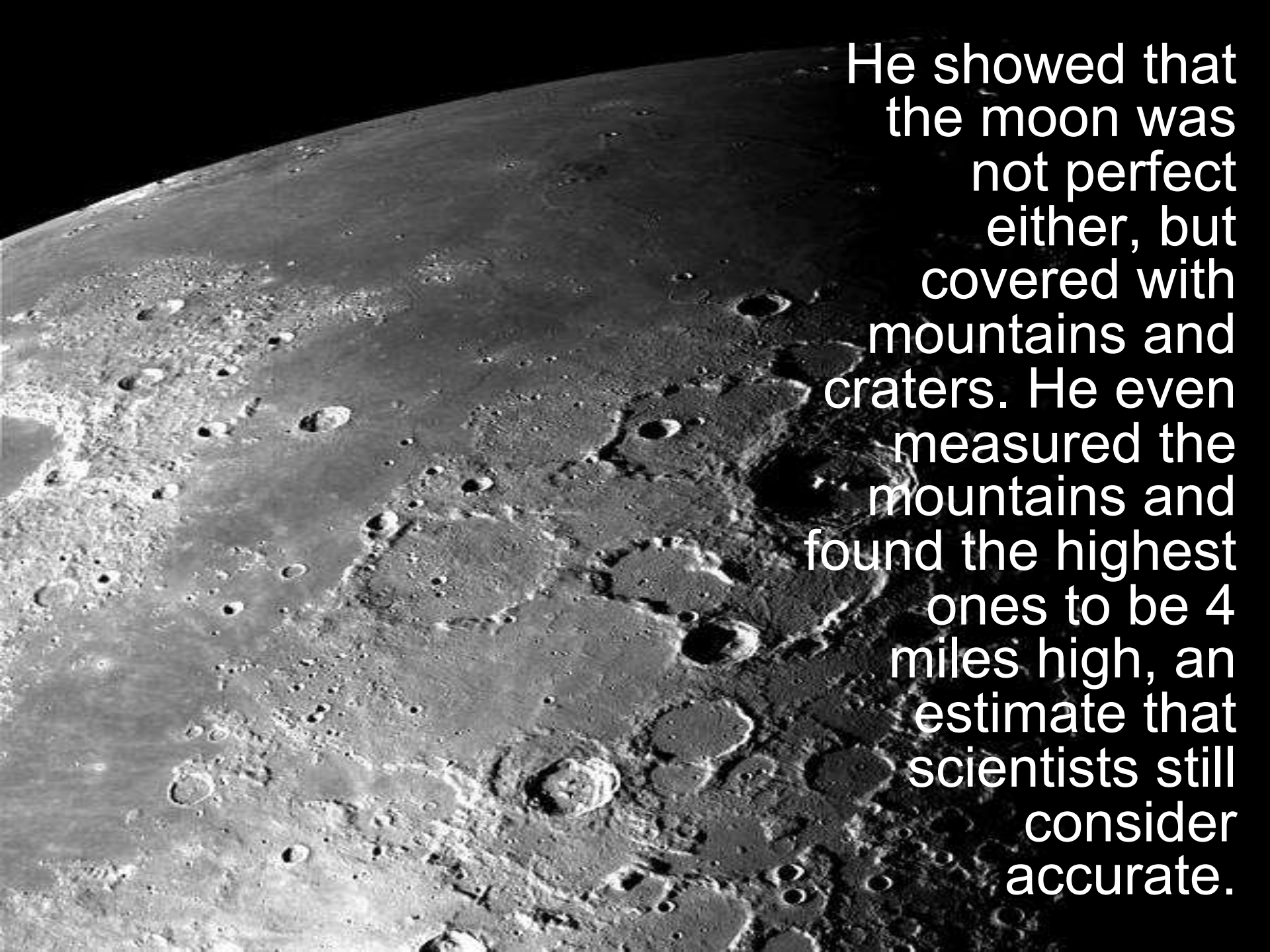


**\*\*Using a telescope that he made himself, the Italian astronomer Galileo Galilei (1564-1642) showed that the sun was not a perfect form, as Aristotle had written.**





Instead, it had dark  
patches called sunspots.



He showed that the moon was not perfect either, but covered with mountains and craters. He even measured the mountains and found the highest ones to be 4 miles high, an estimate that scientists still consider accurate.



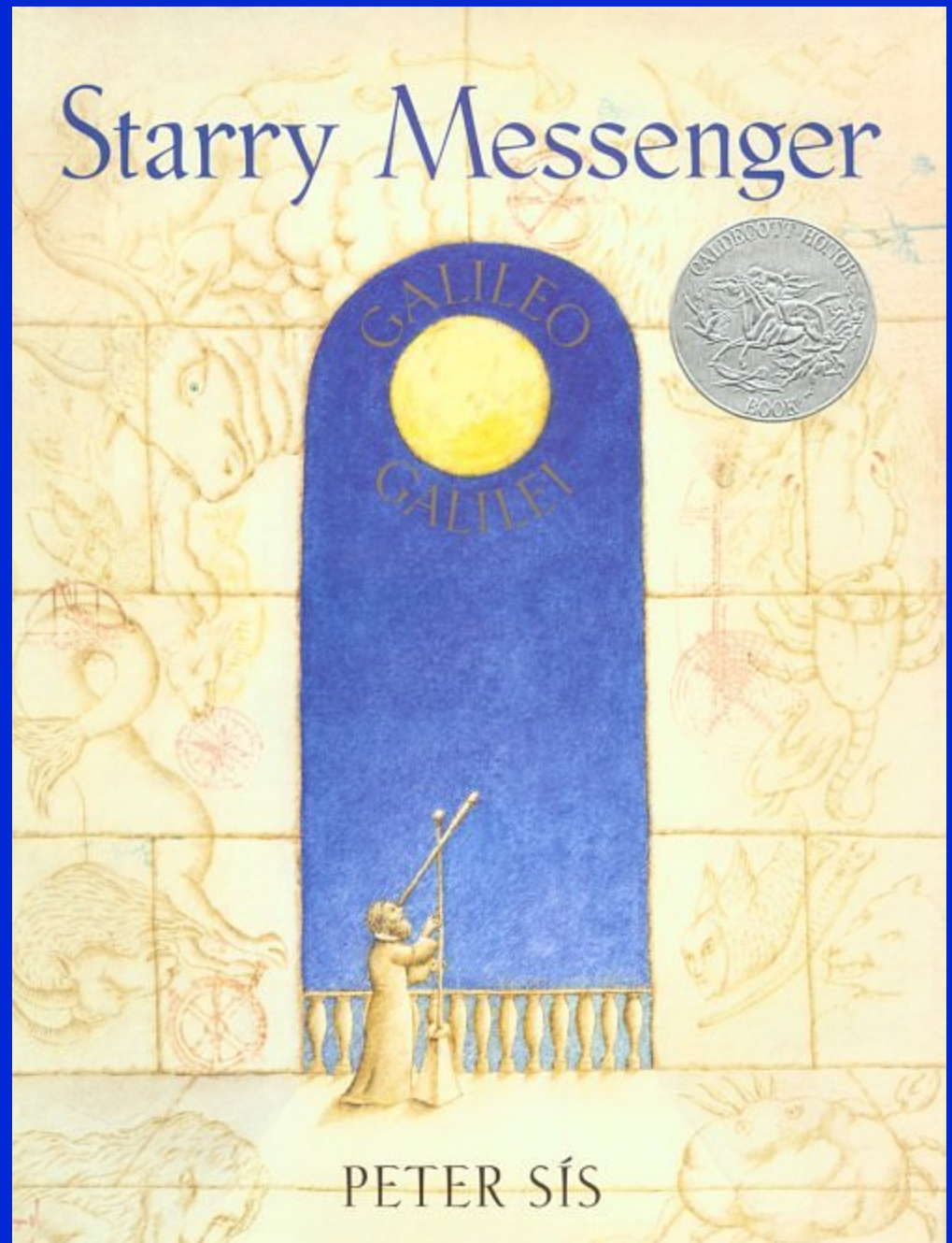
Galileo also used his telescope to discover the largest moons of Jupiter, which he sketched as they revolved around the planet.

Galileo by John-Léon Huens. Viewing the Moon through Galileo's telescope.

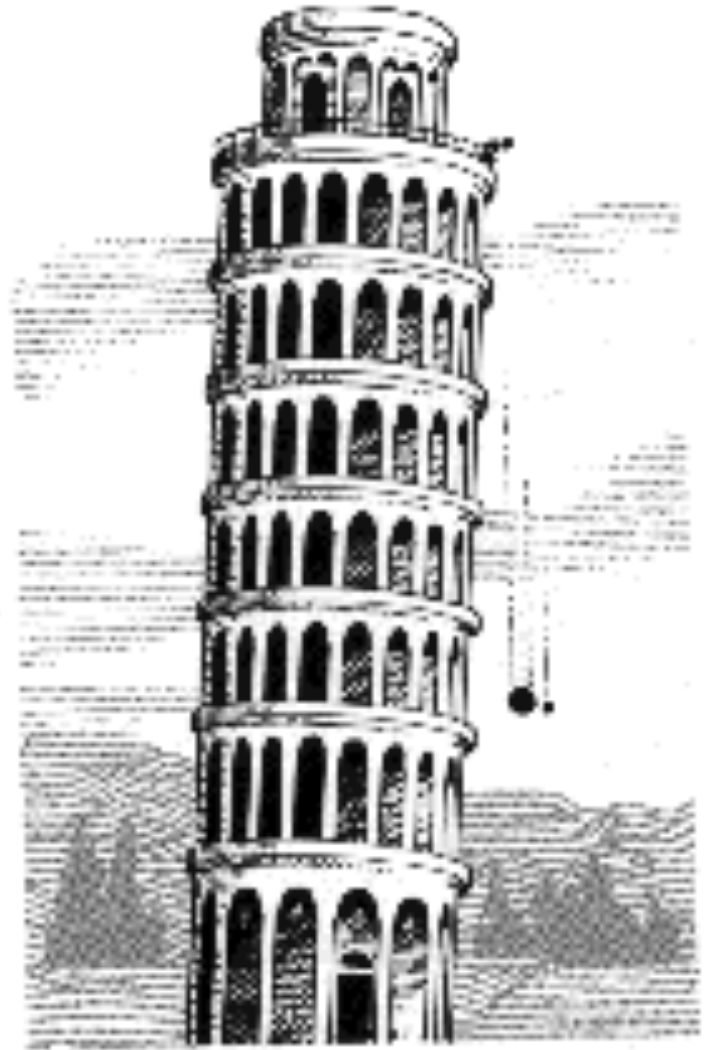


**\*\*He used telescope to support Copernicus's theory that the earth was a planet orbiting the sun.**

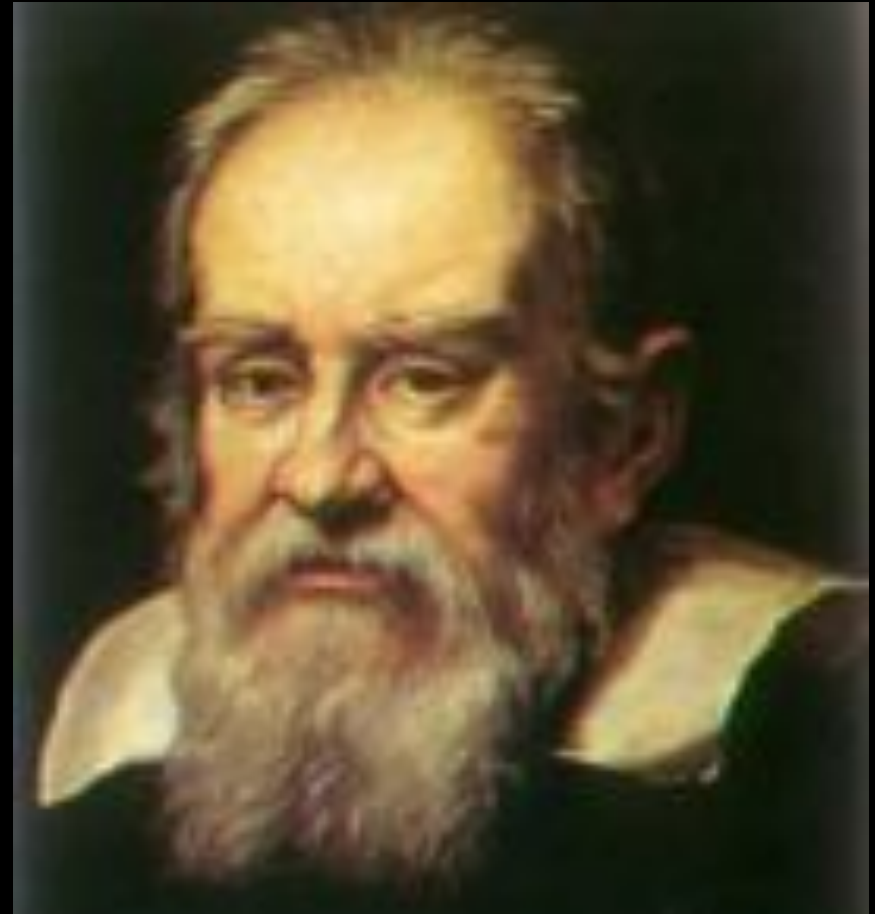
**\*\***He wrote his findings in a book called Starry Messenger, this small book and his later writings created serious problems for Galileo.

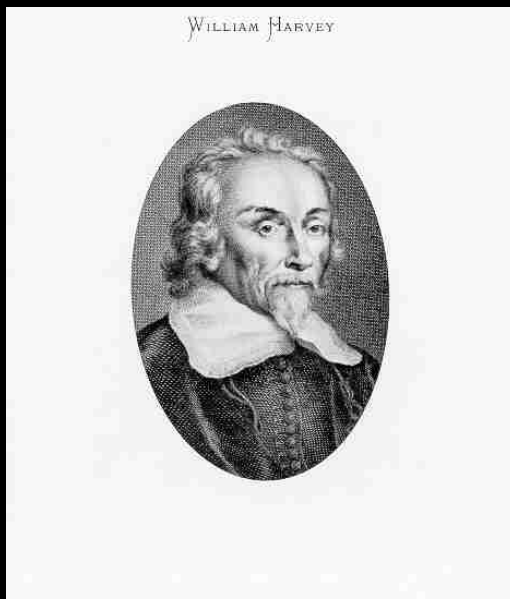


Galileo was a pioneering experimenter. He constructed careful and often elaborate experiments to test his theories. One of his most famous experiments demonstrated that heavy objects are not pulled to the earth any faster than lighter ones are.

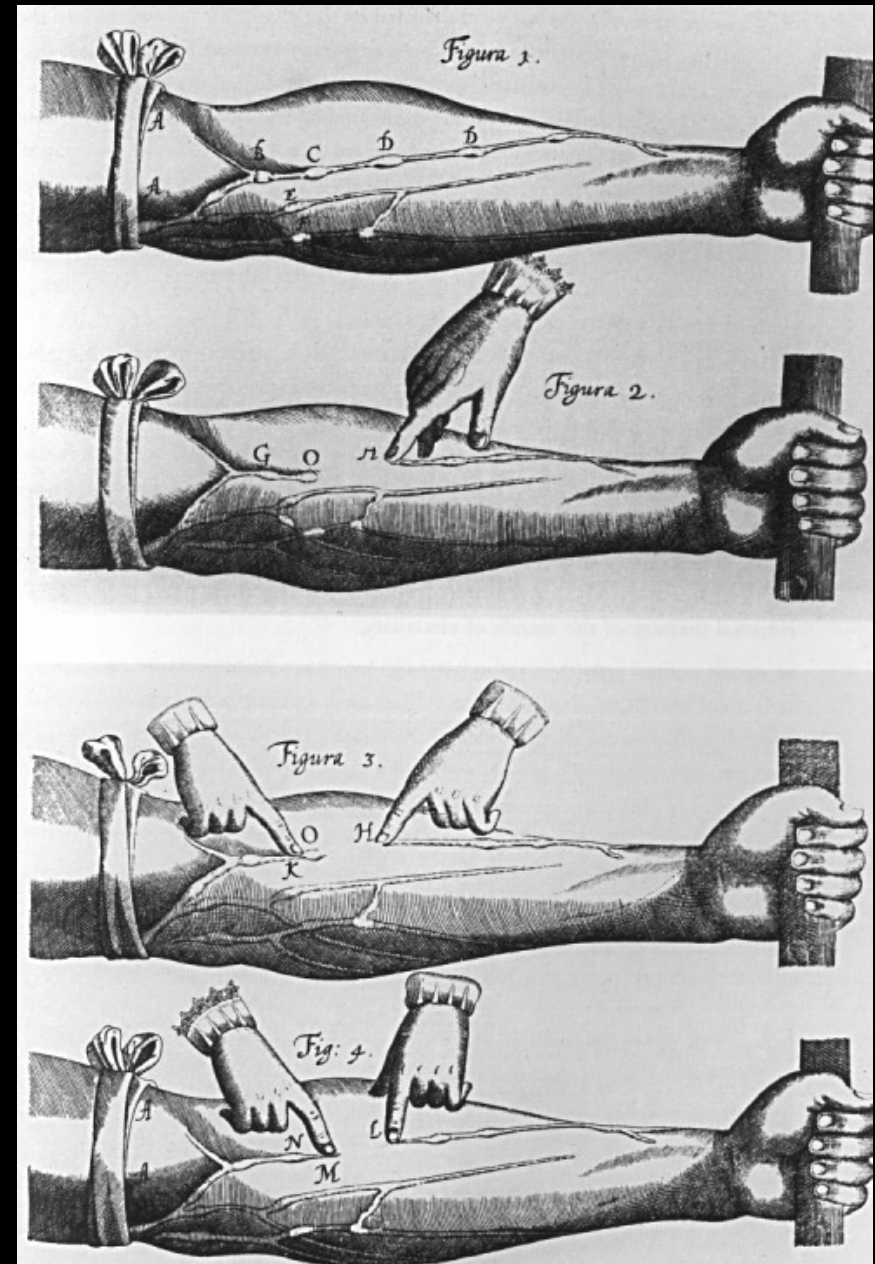


His findings challenged people to accept new ideas about the world, even when they contradicted what people already believed.

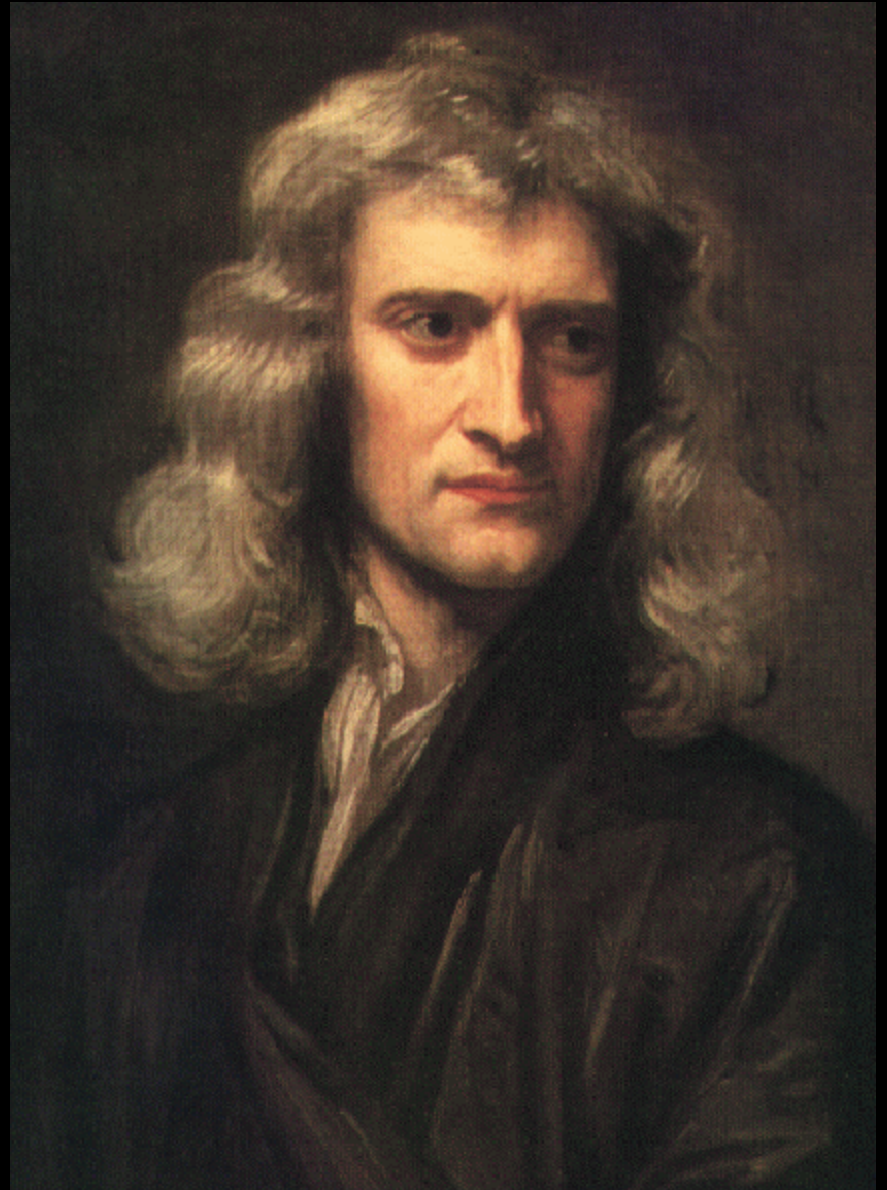




**\*\*English doctor William Harvey (1578-1657) published a study that showed how blood circulates through the body and explained how the valves of the heart function.**



**\*\*English physicist Sir Isaac Newton (1642-1727) proposed that there was a force, gravity that attracted all objects to one another. Gravity, he argued, made things fall to earth, and it also made the planets revolve around the sun. The same force was at work on earth and in the universe.**



PHILOSOPHIÆ  
NATURALIS  
PRINCIPIA  
MATHEMATICA.

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AUCTORE  
ISAACO NEWTONO, EQ. AUR.

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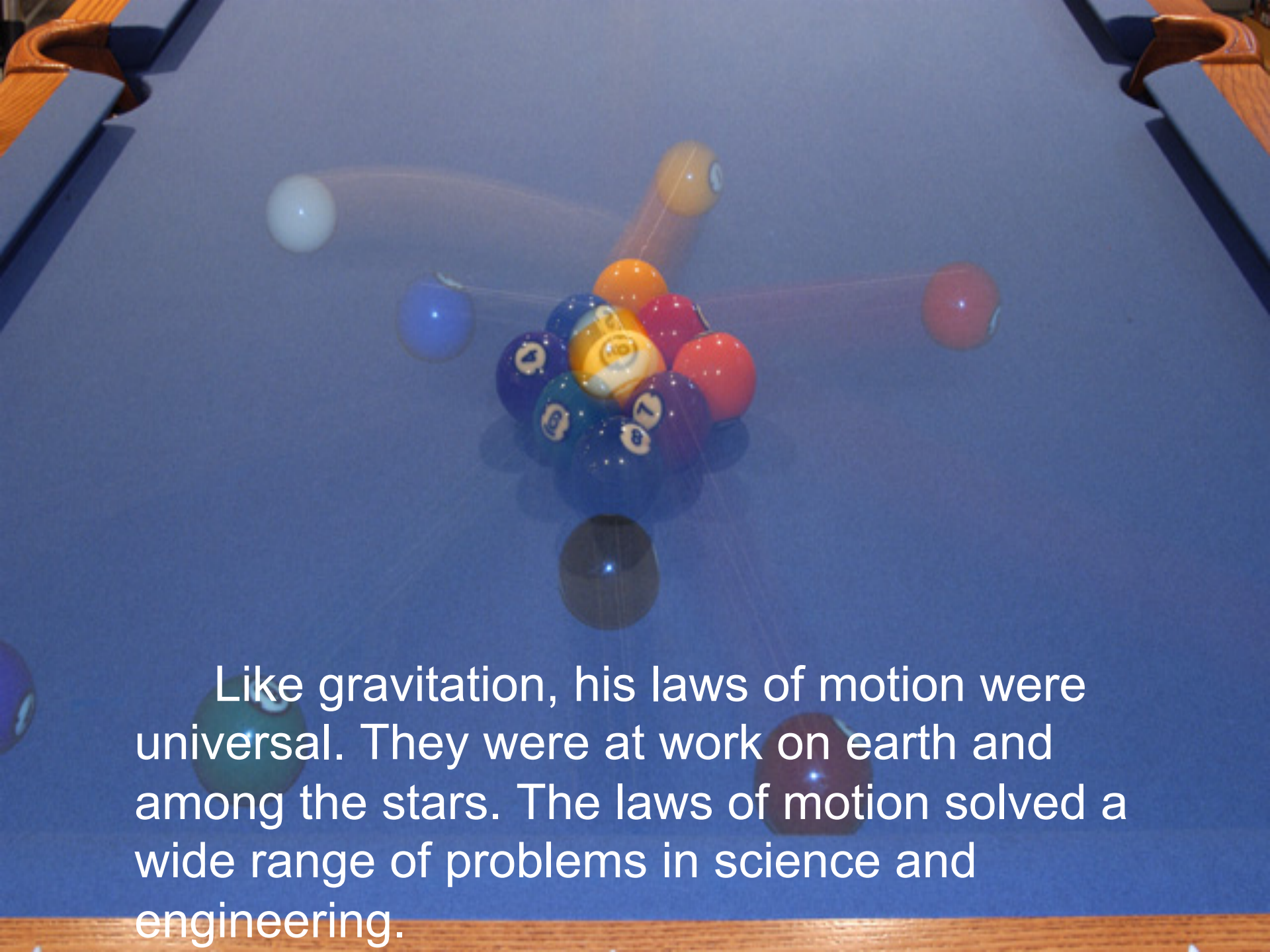
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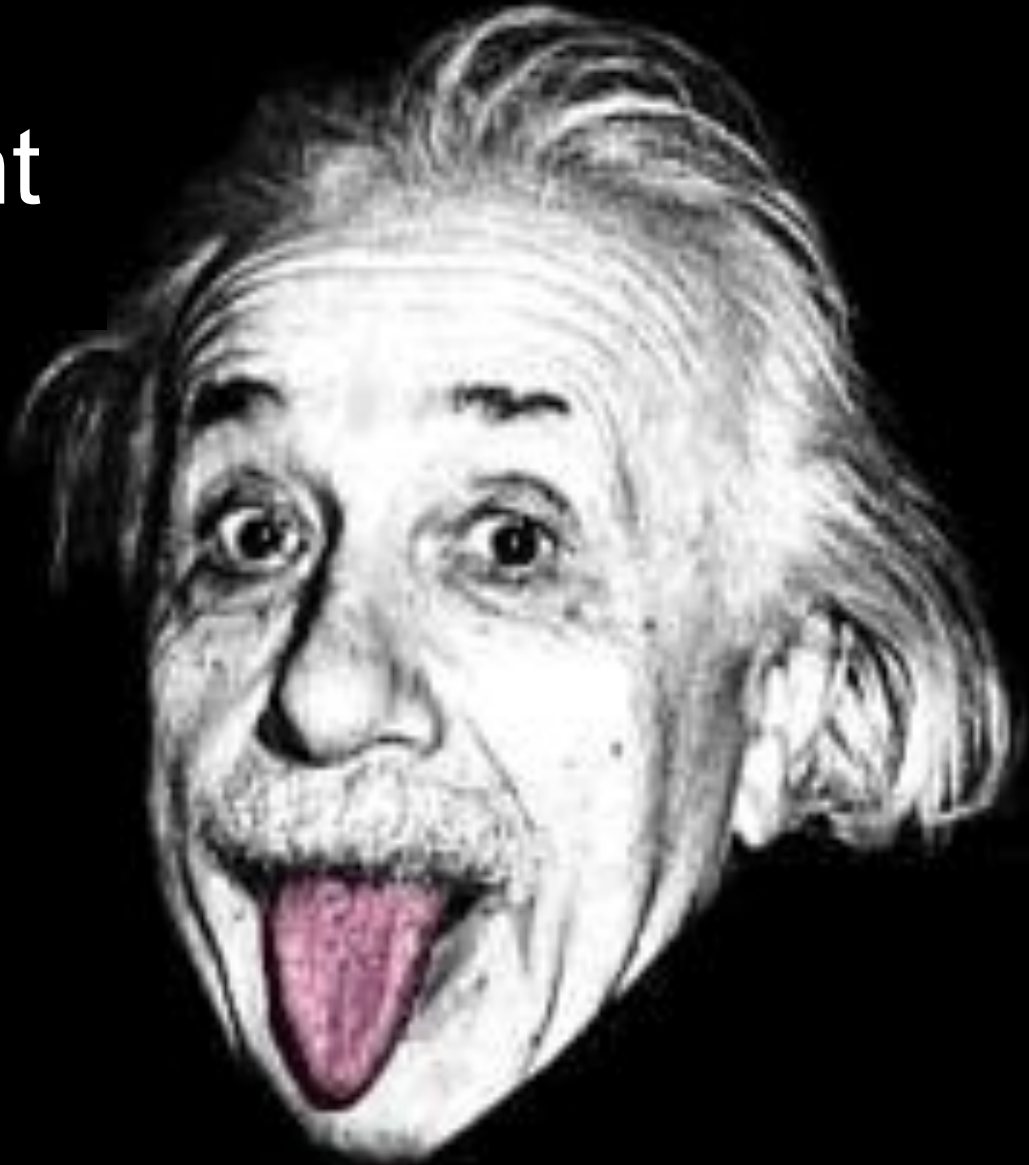
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\*\*In his book Principles of Mathematics, Newton laid down three laws of motion that could predict the orbits of the planets or the movements of billiard balls on a pool table. Like gravitation, his laws of motion were universal. They were at work on earth and among the stars. The laws of motion solved a wide range of problems in science and engineering.



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Until 20th-century  
Scientists such  
as Albert  
Einstein brought  
further  
innovations,  
Newton's laws  
formed the  
backbone of  
physics



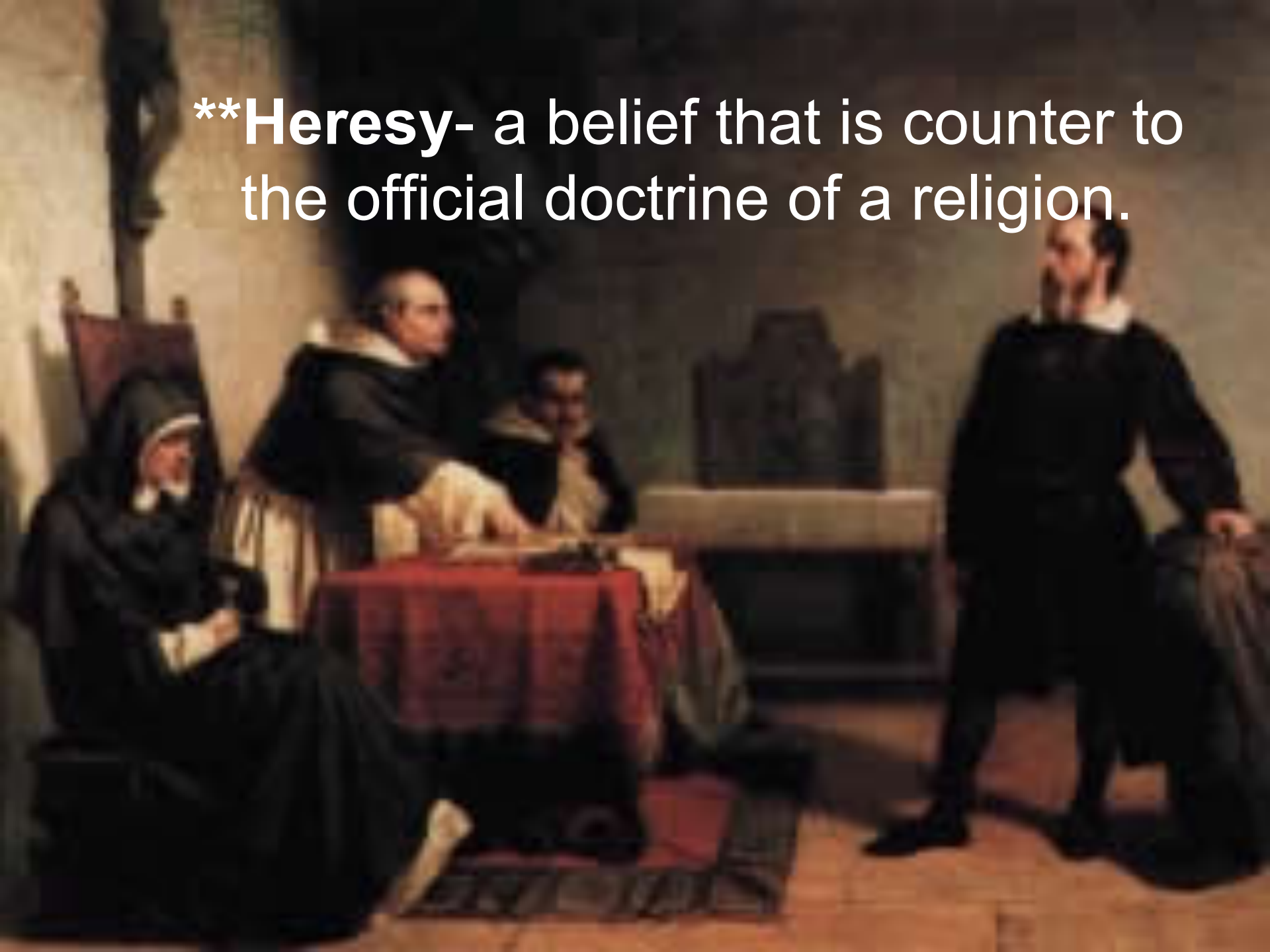
A painting of Galileo Galilei in a study, with a large text overlay. Galileo is depicted in a dark, ornate room, leaning over a table covered with a dark cloth. He is wearing a dark, patterned robe and a white shirt. His hands are resting on the table, and he appears to be looking at something. In the background, there is a window with a grid pattern, and a large, ornate chandelier hangs from the ceiling. The overall atmosphere is dim and scholarly.

The new science challenged the authority of the Church and the state by proposing that truth could be found only in observation and experimentation. Both Catholic and Protestantism leaders interpreted Galileo's support of the Copernican theory of the heliocentric system as dangerous to Christian authority.

By moving the sun to the center of the solar system, Galileo and others relegated the earth to the role of orbiting planet. This made it hard to argue that human beings were the center of the universe. The pope ordered Galileo to stand trial for **heresy**



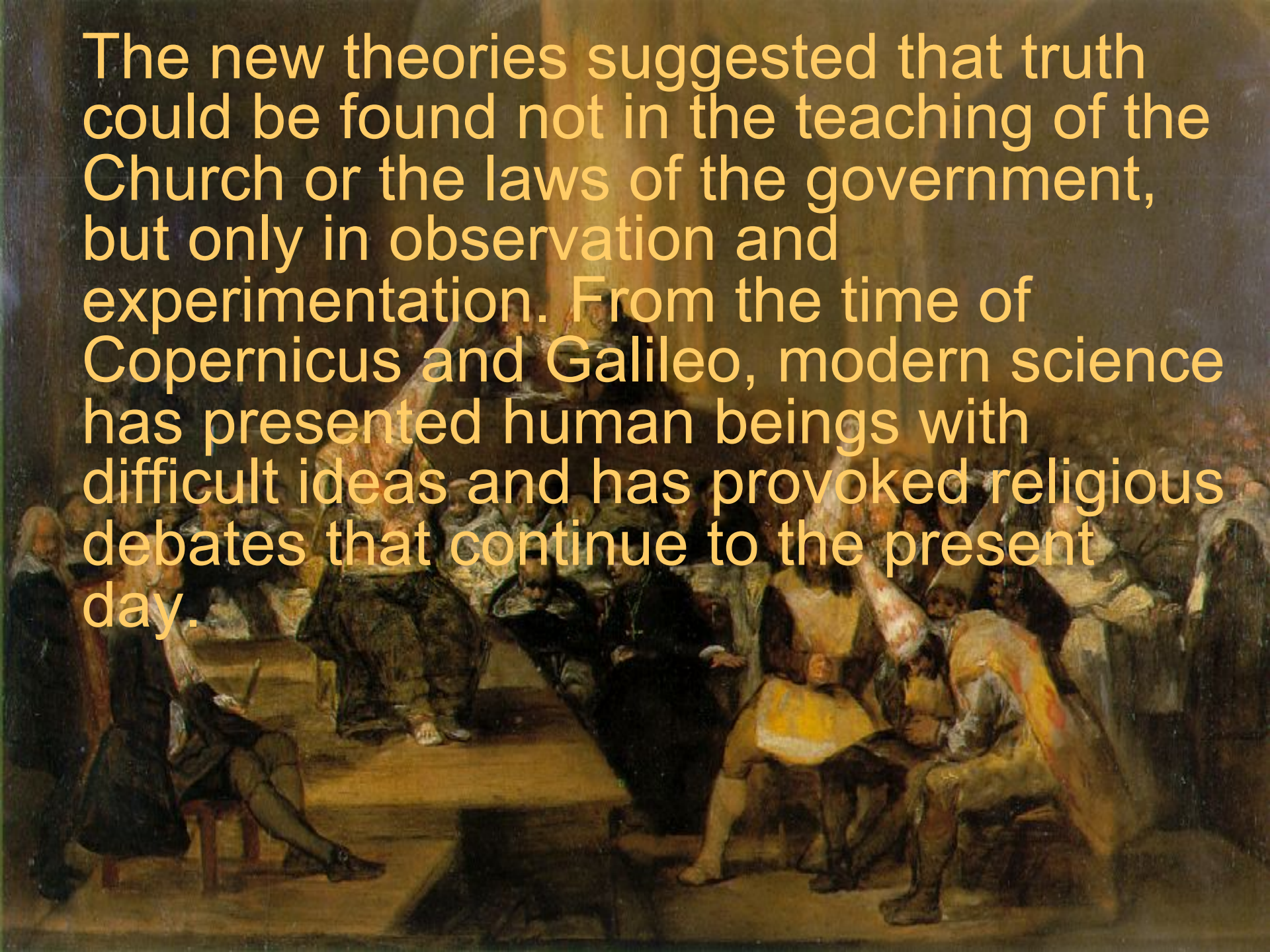
**\*\*Heresy-** a belief that is counter to the official doctrine of a religion.



Under threat of torture and possible death, Galileo made a confession that the ideas of Copernicus were false.



The new theories suggested that truth could be found not in the teaching of the Church or the laws of the government, but only in observation and experimentation. From the time of Copernicus and Galileo, modern science has presented human beings with difficult ideas and has provoked religious debates that continue to the present day.



# The Scientific Revolution

- scientific method (Francis Bacon)
  - =use measurement & reason
  - not belief/superstition

Q: Think about science class.  
What do you do when  
conducting an experiment?  
Why do you do experiments?

## Reflection:

Before SR, knowledge  
based on:

During SR, knowledge  
based on:

Which do you think is  
better? Why?

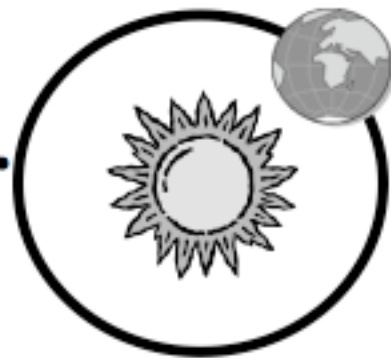
1.



2.



3.



Each set of pictures represents a person of the Scientific Revolution. Write which person each set represents and tell why.

4.









5.



6.



# People of the Scientific Revolution

 Copernicus	<b>Poland</b>	-reasoned the heliocentric theory - sun is center -kept ideas to himself b/c of Catholic Church (heresy)
 Bacon	<b>England</b>	-scientific method - use reason & observation to prove things - not superstition -changed the way people thought
 Kepler	<b>HRE</b>	-used reason & math to prove Copernicus right -used reason & math to discover laws of planetary motion
 Galileo	<b>Italy</b>	-used reason & telescope to prove heliocentric theory -declared heretic - took back what he said
 Newton	<b>England</b>	-used reason to discover Laws of Gravity, Laws of Motion, & calculus
 Harvey	<b>England</b>	-used reason to discover circulation of blood -used reason to study the human body